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THE HARRISON ANTINARCOTIC LAW.

HELD TO BE CONSTITUTIONAL BY A UNITED STATES DISTRICT COURT.

The United States District Court for the Western District of Washington has decided that section 8 of the Harrison antinarcotic law¹ is constitutional. This section provides that possession or control of the habit-forming drugs named in the act, by a person who has not registered and paid the special tax, is unlawful, and such possession or control is made presumptive evidence of a violation of the act.

The court said that the purpose of the act was to prohibit the importation, manufacture, or sale of opium and the other drugs included in the act, and that Congress had "the right to make it unlawful for any person who has not complied with the provisions of the act by registration or paying a tax, to have in his possession this 'outlawed' article."

The opinion is published in full at page 3631 of this issue of the Public Health Reports.

STRYCHNINE SULPHATE.

ITS EFFECT ON CALIFORNIA VALLEY QUAIL.

By C. C. PIERCE, Senior Surgeon, and M. T. CLEGG, Bacteriologist, United States Public Health Service.

For several years the United States Public Health Service, in cooperation with the California State Board of Health, has been conducting a campaign for the eradication of ground squirrels. This work is being carried out under a State law and on account of plague infection existing among California ground squirrels.

One of the methods used to destroy squirrels is distributing poisoned barley over infected lands during the dry season. Barley is

¹ This law was published in the Public Health Reports Feb. 19, 1915, p. 573.

the only grain used for this purpose and was selected because the squirrels take it readily, while birds are not particularly attracted by the barbed grain, the spines not being removed in the cleaning process.

The formula and method of preparing this poisoned barley are as follows:

Whole barley (recleaned)-----	pounds	18
Strychnine sulphate-----	ounce	1
Soda (bicarbonate)-----	do	1
Saccharine -----	dram	1
Thin starch paste-----	pint	1
Corn sirup (Karo or equal)-----	ounces	2

Dissolve the strychnine in hot water; thicken with starch to about the consistency of thin soup. Dissolve the soda in one-half pint of hot water and add a little at a time to the poisoned starch until effervescence ceases; then add the sirup and saccharine, mix well, and apply to the grain, stirring constantly until the poison is evenly distributed throughout and the grain is thoroughly dry.

This formula is particularly advantageous on account of the fact that the bitter taste of the strychnine is delayed for several minutes, and squirrels can pick up and place in their cheek pouches a considerable quantity before any bitter taste is noted. It is then too late for the squirrel to get rid of the poison, as enough of it has been absorbed through the mucous membranes of the cheek pouches to kill the animal.

Extensive experience with this type of poisoned barley has shown an effectiveness far ahead of any other type of poisoned grain tested. Young or half-grown squirrels have, in most instances, been practically exterminated, and the percentage of adults or full-grown squirrels destroyed is far higher than with other types of poisoned grain used.

At various times the effect which the extensive use of this poisoned grain might have upon valley quail has been questioned. The officers and employees engaged in squirrel-eradication work have never observed any mortality among quail as a result of the poisoned grain. In order to give a definite answer to the State game and fish commission experiments were carried out at the Federal laboratory, San Francisco, to determine the minimum lethal dose of strychnine sulphate for the California Valley quail, and further to determine what effect the poisoned barley, distributed under the direction of the United States Public Health Service for the destruction of the ground squirrels (*Citellus beecheyi*), might have upon the quail. It was found that for four quail tested the minimum lethal dose of strychnine sulphate, given subcutaneously, was 4 milligrams for each 100 grams of body weight.

TABLE NO. 1.—*Showing the minimum lethal subcutaneous dose of strychnine sulphate for quail compared with that for guinea pigs and ground squirrels.*

Subject.	Weight in grams.	Dose in milli- grams.	Dose in milli- grams per 100 grams body weight.	Result.
Quail No. 1.....	150	2	1.3	No symptoms.
Quail No. 2.....	145	4	2.7	Do.
Quail No. 3.....	148	4	2.7	Do.
Quail No. 4.....	147	6	4	Death.
Guinea pig No. 1.....	381	4	1.05	Convulsions; death.
Guinea pig No. 2.....	201	4	2	Do.
Guinea pig No. 3.....	362	2	.5	Do.
Squirrel No. 1.....	450	2	.4	Do.
Squirrel No. 2.....	530	.5	.09	Convulsions; recovery.

It will be noted that the amount of strychnine reckoned by body weight fatal for quail No. 4 was 10 times greater than the fatal dose for squirrel No. 1 and 40 times greater than that which produced convulsions in squirrel No. 2.

Feeding Experiments, Using Pure Sulphate of Strychnine.

Forced feeding was carried out. This experiment, of course, does not show the amount of strychnine that would be fatal were the quail fed under natural conditions, as a certain amount of the strychnine was absorbed through the upper membranes during the process of feeding. Four quail were used. Six milligrams for every 100 grams of body weight produced convulsions but not death.

Feeding Experiments, Using Poisoned Barley.

The barley used in these experiments was obtained from the contractor furnishing poisoned barley for the Public Health Service, mixed according to the Service formula and containing 10 milligrams of strichnine sulphate to each 2.9 grams of weight or 70 grains of barley. Four quail, the heaviest weighing 170 grams and the lightest weighing 153 grams, were fed varying amounts of the barley. The feeding time in one case was 10 minutes. This quail consumed 70 grains of barley, containing 10 milligrams of strychnine. Another consumed 140 barley grains, containing 20 milligrams of strychnine, during a period of 24 hours; and one consumed 280 barley grains, containing 40 milligrams of strychnine, during a period of 48 hours. In none of the quail were there any symptoms of poisoning.

In order to test the toxicity of the barley, four squirrels were fed the following amounts:

- 19 grains of barley, containing 2.7 milligrams of strychnine.
- 30 grains of barley, containing 4.3 milligrams of strychnine.
- 33 grains of barley, containing 4.7 milligrams of strychnine.
- 40 grains of barley, containing 5.7 milligrams of strychnine.

TABLE No. 2.—*Test to determine the amount of poisoned barley fatal to quail, compared with that fatal to squirrels.*

Subject.	Weight in grams.	Number of grains of barley.	Amount of strychnine sulphate (in milligrams).	Time consumed in feeding. ¹	Results.
Quail A.....	153	70	10	10 minutes..	No symptoms.
Quail B.....	173	140	20	24 hours.....	Do.
Quail C.....	157	(?)	(?)do.....	Do.
Quail D.....	168	280	40	48 hours.....	Do.
Squirrel A.....	455	40	5.7	1 hour.....	Convulsions; death. ²
Squirrel B.....	440	33	4.7do.....	Do. ²
Squirrel C.....	445	30	4.3	2 hours.....	Do.
Squirrel D.....	425	19	2.7	10 minutes..	Do. ²

¹ "Time consumed in feeding" designates the time occupied in giving the amount of strychnine indicated. Quail A had been starved for 48 hours; quails B, C, and D were fed on nonpoisoned grain before receiving the poisoned barley. Cages were then cleaned of all food and a definite number of grains of poisoned barley were placed in the feeding pans.

² Convulsions occurred within 30 minutes after the poisoned barley was pouched by the squirrels, and death within 2 hours.

^a Death occurred in 1½ hours.

In each case convulsions and death occurred within a period of two hours after administering the barley, and in each case the barley was reclaimed from the pouch of the squirrel after death, showing what had already been proven, that strychnine is rapidly absorbed through the membranes of this organ.

Conclusions.

(1) California Valley quail may be fed, under natural conditions, relatively large amounts of strychnine sulphate without showing toxic symptoms.

(2) The minimum lethal dose by subcutaneous injection is 4 milligrams per 100 grams of body weight.

(3) The California ground squirrel (*Citellus beecheyi*) is very susceptible to strychnine sulphate; 0.09 milligram per 100 grams of body weight produced convulsions.

(4) Nineteen grains of barley, containing 2.7 milligrams of strychnine sulphate, when retained in the pouch of the ground squirrel, proved fatal.

(5) Poisoned barley, as used for ground-squirrel eradication, does not cause the death of California Valley quail under natural feeding conditions.